

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

FINANCIAL DEVELOPMENT AND AGRICULTURAL SECTOR IN GHANA:
AN ECONOMETRIC ANALYSIS

BY

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DECLARATION

I solemnly declare that this is a work that is mine submitted towards an MSC degree and to the best of knowledge, it neither contain a material published in the past nor material previously accepted by any University for to award degree except where I cited and accorded due acknowledgement in the work.

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DEDICATION

This paper is dedicated to Almighty Allah, the Mighty and Great Bestower, Prophet Muhammad (S.A.W). It is also dedicated to my late Dad and Mum, the Late Alhaji Ussif Abdullah (7-7) and Hajia Sirina.

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ABSTRACT

This study was purposefully carried out to determine the effect of financial development on Agricultural value added as a fraction of GDP. Time series data was employed covering a period from 1961 to 2014. The study also specifically investigated the trend dynamics (short and long run) of financial development and Agricultural value added as a fraction of GDP relationship. For the trend analysis, ARDL Bound test and FMOLS Wald test were used. Three different regression estimators were used for the impact analysis in order to derive a more convincing results. These are; Fully Modified Ordinary Least Square (FMOLS), Autoregressive Distributed Lag (ARDL), and Canonical Cointegration (CCR). The variables employed in this study are Agricultural value added as a fraction of GDP, Broad money supply as a fraction of GDP, Domestic credit to private sector as a fraction of GDP, Agricultural machinery and tractors per Agricultural land and rural population as a fraction of total population. Based on the ARDL coefficient diagnostic test, the result shows, there exist a short-run relationship among the variables and were cointegrated in the long run. Same was the case in the FMOLS Wald test when the variables; Agricultural value added fraction to GDP, M2 fraction to GDP, Domestic credit to private sector fraction to GDP and Agricultural Machinery and tractors per Agricultural land were employed in the model with FINSAP inserted in the model as a deterministic variable. The results from ARDL, FMOLS and CCR all indicated that increased financial development (when Domestic credit to private sector as a share of GDP was used as proxy) leads to a fall in Agricultural value added share of GDP. However with Broad Money Supply share of GDP, it was positively related to Agricultural value added per GDP but significant only in the ARDL estimate. This means, the effect depends on the measure used. These findings concretized the notion that, the best way to improve Agricultural output in Ghana is through subsidy and credit support from Government.

KEYWORDS

Agricultural value added as a fraction of GDP, Financial Development, Broad Money Supply as a fraction of GDP, Domestic Credit to Private Sector as a fraction of GDP, Agricultural Machinery and Tractors per Agricultural Land, Rural Population as a fraction Total Population, Cointegration, Auto regressive distributed lag (ARDL), Fully Modified Ordinary Least Square (FMOLS), Canonical Cointegration (CCR).

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CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

There is a lot of work in the literature that collectively attest to the finance-growth nexus. (World Bank, 1989). These works albeit differences in the direction of the causation, which is whether it is supply leading or demand driven do show a causation between them.

Many authors like McKinnon (1973), Shaw (1973), Fry (1988), Schumpeter (1993) and Levine (2004) argue that financial growth stimulate economic growth through enhanced savings mobilization, capital accumulation and investment. They also argue that this growth in the financial sector means an increase in financial institutions and services which foster competition in service delivery that ensures efficient disbursement of funds to productive sectors of the economy.

On the other side also are authors like Greenwood and Jovanovic (1990), Arestis and Demetriades (1991), Robinson (1952), Lucas (1988), who believed in demand stimulating financial development argued in the opposite, which is, it is rather the expansion of economic activities that stimulates or catalyze the spring up of financial institutions and intermediations. These works however does not tell us to what extent does financial development affect some important component of economic growth like agriculture. A scrutiny to the best of the researcher's ability shows few empirical works exist on this nexus (financial development and agriculture) and absolutely none in the researcher's home country, Ghana.

Ghana, after the financial sector reform in the 1980s proposed by the International monetary fund saw a rise in both the number of financial intermediaries and financial services due to ‘free’ entry and relatively liberalized interest rate. This rise saw an increase in financial development indicators like M2 to GDP and Domestic credit to private sector to GDP ratios. (Bawumia, 2010)

According to the World Bank “M2 which is Money and Quasi Money comprise the sum of currency outside banks, demand deposits other than those of the Central Government, savings deposit, time deposit and foreign currency deposits of resident sectors other than the central government”. A World Bank (2013) report indicated that M2 to GDP ratio growth was comparatively steady at 21% from 1964 to 1974, then went up for some time in the middle of 1970s, peaked at 29% in 1976 and strongly fell to 11.3% in 1983.

According to a data from the World Bank, domestic credit to private sector as a percentage of GDP recorded its lowest value (1.54%) in 1983 and highest ever was recorded in 2014 at 19.89%. From the data, the indicator experienced a relatively higher and stable rise from the period 1999 all the way to 2014. All the years for instance recorded a percentage point above 10 with 2008, 2013 and 2014 recording the highest point of 15.83%, 16.07% and 19.89% respectively.

A country that is experiencing a sustained rise in this financial depth indicator *ceteris paribus*, is on a trajectory of improving economic growth and development. This is intuitively so because, rising domestic credit to private sector as a GDP percentage means, increasing domestically mobilized financial resources that is extended to the private sector. More funds in the hands of the private sector stimulate growth through a rise in GDP. This is so not only to the fact that, the private sector is a component of aggregate demand but because the sector is seen by economist

(especially capitalist) as the engine of growth due to its ability to create employment, produce goods and services utilized by households and to some extent firms and ultimately increase aggregate demand.

Agriculture in Ghana was a major source of wealth and income and the largest sector in terms of contribution to GDP (about 50%) for decades before being dominated recently by the service sector. Cocoa alone in 1955 provided about three-fifth of total export earnings (Issahaku, 2012). It is currently the second largest contributor employing the highest percentage of the citizens, serving as a source of foreign exchange, and providing food for citizens as well as raw materials to local industries. The importance of agriculture in any economy especially developing countries like Ghana can never be over emphasized due to its ability to eradicate poverty, ensure food security, create employment and foreign exchange which strengthens the trade balance and ultimately the balance of payments. Thus the multiplier effect of an improved agriculture output or investment is very healthy for economic growth. Enu in 2014 found a positive relationship between agriculture sub-sectors in Ghana and economic growth with cocoa having the most effect. Amidst factors like land, labor, human development and capital that affect agriculture output, capital arguably stands out as the most important factor that affects the real sector. Developing countries' greatest challenge is capital and human development but research conducted by (Dehejia and Muney, 2007) shows a positive relationship between finance and human development meaning financial development influences human development positively and therefore, finance among the factors is well suited as an explanatory variable for agriculture investment.

Intuitively, credit has an influence on agriculture output since inputs and factors like seeds, weedicides, pesticides and land, labour respectively are acquired by finance. Increased availability and accessibility to credit all things being equal means farmers can increase their investment through the acquisition of more inputs and factors of production as well as shifting from labor intensive to medium and highly sophisticated machineries.

Empirical evidence on this correlation shows a conflicting sign, with (Afangideh, 2009 and chisasa, 2014) works showing a positive correlation between finance and agriculture whiles (Dehejia and Muney, 2007) established an opposite relation between finance and farming in the U.S.

This work (financial development and agriculture sector in Ghana) seeks to assess the financial development (Domestic credit to private sector to GDP ratio and M2 to GDP ratio) impact on agriculture growth in Ghana by running multiple regression analysis.

1.1 Problem Statement

Many research works have given credence to the finance-growth nexus (World Bank, 1989). The nature of the causation however saw researchers differing, with some arguing that development of financial sector causes economic growth through enhanced savings mobilization, capital accumulation and investment. Others also argued in the opposite, an expansion in the real sector rather trigger the needed financial services, so that where demand exist, supply follows.

With these undisputable facts espousing the finance-growth nexus both in Ghana and abroad the question one may ask is does this financial deepening matter to real individual sectors of the

economy like agriculture looking at how the agricultural sector contribution to GDP has been declining marginally over the years. Theoretically, the answer will depend on how a sector utilized the credit since most lending institutions will seek to maximize returns on their funds by extending credit to the most productive economic sectors. Thus the most efficient sector will acquire chunk of the funds. This decline (from contributing half of GDP in 1950's to about 22% in 2014) however can be attributed to so many factors like climate change, rainfall, lack of knowledge and skills on the part of farmers leading to poor production and management practices, Dutch disease and most importantly less investment in the sector due to finance limitations.

Ghana, during the pre-financial sector reform (especially from 1950 all the way to 1960) witnessed a vibrant agriculture sector. The sector was the leading contributor to GDP, contributing almost half of GDP according to Issahaku. However, the sector, after the reforms that begun in April 1983 which encouraged the spring up of Banks and other financial institutions surprisingly started to experience a marginal decline in Agriculture output to the extent that the sector lost its position as the larger sector to GDP to the Service Sector in 2007. This outcome is baffling and hence the need for an investigation to ascertain the true correlation that exist between these variables.

In the literature also, there is opposing results on this relationship. (Afangidah, 2009 and Chisasa, 2014) found a positive relationship between finance and agriculture output whiles (Dehejia and Muney, 2007) found out that financial development and farming are correlated negatively in United States. This paper therefore seeks to analyze to what extend does financial sector development matter to agriculture growth in Ghana.

1.2 The Study Objectives

1.2.1 Primary objective:

This work seeks to analyze the impact of financial development on agriculture output in Ghana.

1.2.2 Secondary objectives:

1. To assess the long-run and short-run relationship between financial development (M2 to GDP and Domestic credit to private sector to GDP ratios) and Agriculture output in Ghana.
2. To analyze the effect of Broad Money (M2) to GDP on agriculture growth in Ghana.
3. To analyze the effect of domestic credit to private sector to GDP on agriculture growth in Ghana.

1.3 Research Questions

1. What is the long-run and short-run relationship between financial development (M2 to GDP and domestic credit to private sector to GDP ratio) and Agriculture growth in Ghana?
2. What is the impact of financial development on agriculture growth in Ghana?

1.4 Hypothesis

1. Ho: There exists no impact on agricultural sector from financial development
2. H1: There exists an impact on agricultural growth from financial development.

1.5 Justification of the Study

Agriculture is a very important sector in every economy. Its role in eradicating poverty, creating employment, raw materials for use by domestic firms, food security and foreign exchange cannot be overstated. Expectantly, agriculture investment all things being equal should improve, as finance deepens because financial development increases financial institutions and services and thereby increasing the opportunity of acquiring funds by investors.

In the literature, there are opposing results in the sign of the finance-agriculture growth nexus. (Afangideh, 2009 and Chisasa, 2014) found out that the relationship is positive, that is the financial development and agriculture output nexus while (Dehejia and Muney, 2007) established that the finance-agriculture (farming) nexus is negative in U.S. There exist also few works on this relationship in empirical literature but a zero work exists in Ghana relative to the researcher's effort to find one. This opposing result coupled with limited work in this area necessitates the call for this thesis.

1.6 Brief Methodology

This work will employ a secondary data. Data on 3 main indicators namely M2 to GDP ratio, Domestic credit to private sector to GDP ratio, and Agriculture value added as a share of GDP and other control variables spanning from 1961-2014 which will be derived from the World development indicators (WDI). The indicators covered are over 800 covering more than 150 countries. A publication is released annually in April with the online database updated thrice in a year.

An econometric model will be constructed base on economic theory and the nature of the Ghanaian economy.

A unit root test, co-integration test and impact analysis will be carried out using Cointegrating regression (FMOLS and CCR) and Autoregressive distributed lag (ARDL).

EvIEWS 9 and other relevant statistical packages will be used for data analysis.

1.7 Scope and Delimitation of the Study

A lot of study covers more than one instrument as a proxy for financial development but this work uses only Domestic credit to private sector to GDP and M2 to GDP ratios as a proxy variable. The study is an in-country one and will use time-series data from WDI on Ghana from 1961-2014 on agricultural value added per GDP, M2 to GDP, and Domestic credit to private sector to GDP ratios.

1.8 Organisation of the Study

This work will be split into five (5) different chapters. The chapter one will comprised the Background, Statement of the Problem, Study Objectives, Research Questions, Delimitation and Scope, Justification and Organization of the Study. Second chapter will be made up of Theoretical and Empirical Review of imperative Literature. Chapter three will entail the Method to be used. The chapter four will be Analysis and Presentation of Empirical results and finally the fifth chapter Summarizes, Conclude and Recommend Policy emanating from the Study.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE

2.0 Introduction

This chapter is divided into two main part; theoretical and empirical literature. The first part; discusses the meaning of financial development, the role of the financial system, the financial sector in Ghana before and after the introduction of the financial reforms, FINSAP, FINSSP, financial depth with an emphasis on two indicators; M2 as a share of GDP and domestic credit to private sector as a share of GDP, agricultural sector in Ghana and finally finance growth linkage. The empirical portion discusses existing works on finance driven growth, growth driven finance, the feedback in causation between finance and growth and finally finance-agriculture relationship.

2.1 Meaning of Financial Development

Attempts have been made to capture what constitute financial development¹ empirically. Generally, when an economy experiences financial deepening, it is agreed that the financial sector of that economy is developing. Increases in ratios such as private credit to GDP, capitalization to GDP, and M2 to GDP are indicators of financial deepening.

However, if the concept of financial development is limited to financial deepening, a vital component of the process is taken away. Goldsmith (1969) noted that an indicator of financial development is the springing up of various financial institutions and instruments (in other words, the expansion in the financial superstructure). Goldsmith attempted to provide a measure

for financial development through his Financial Interrelations Ratio (FIR). This, according to Goldsmith, is “the quotient of the aggregate market value of all financial instruments in existence in a country at a given date to the value of its tangible net national wealth”. According to Goldsmith, the higher the FIR, the higher the level of financial development and vice versa.

Rajan and Zingales (1998) argued that an appropriate measure of financial development should capture the ease with which deficit spending units acquire loanable funds to finance sound projects. They concluded that a well-developed financial system should be able to forecast and hedge risk in cost effective manner. The important contribution of their view to the meaning of financial development is the risk forecasting and hedging component.

Another aspect of financial development is the legal and institutional framework. According to Fry (1995), a developed financial system has adequate prudential regulation and supervision of commercial banks. In the case of securities aspect of financial development, sound regulatory and supervisory frameworks are in place to prevent practices, such as, false trading, insider trading, and agency problems. Fry (1995) identified four other signals of financial development: (1) significant level of price and exchange rate stability, (2) fiscal discipline in form of sustainable government borrowing (from the central bank) which does not put inflationary pressures on the reserve money or a sustainable government borrowing (from external sources) which does not increase capital inflows meriting large purchases of foreign currency by central bank to avoid exchange rate appreciation, (3) competitive profit-maximizing attitude by commercial banks, and (4) a tax regime devoid discriminatory explicit or implicit taxes on financial intermediation.

The conclusion that could be drawn from the above views is that financial development is a process. This process could be grouped into three distinct parts: (a) the development of financial

institutions, (b) the development of varied and complex financial instruments and services, and (c) sound regulatory and supervisory frameworks to prevent the financial institutions and intermediaries from indulging in malpractices which may put the economy at risk.

2.2 The role of Financial Systems

A financial system that is highly developed and sophisticated can help in the growth of an economy through two complementary but different mechanisms. The first mechanism is through total factor productivity and the second is through the accumulation of capital. The capital accumulation channel was built from the debt-accumulation hypothesis propounded by Gurley and Shaw (1955). The financial system here serves as financial intermediaries by mopping up excess funds from the system and allocating them to the most efficient part of the economy. A persistent allocation of these resources to the most vibrant and efficient sectors leads to significant economic growth. The second channel facilitates growth through the minimization of information asymmetry that comes with financial operation. A way to ensure project monitoring and efficient allocation of funds is through improvement in the financial sector. Researchers like Levine 1997, Ang 2008, Demirguc-Kunt and Levine 2008 came out with five functions of the financial system. As put forward by them, the roles of the financial system are mobilization of excess funds, resources allocation, risk management, exercising corporate control and facilitating transaction.

2.2.1 Mobilization of Excess Funds

Mobilization of excess funds from the system (from savers) is a very difficult task not only because it comes with monetary cost but because depositors must have profound confidence in the financial institution before entrusting their resources to them. Levine (1997) espoused two

different costs that comes with savings mobilization. The first one is the transaction cost, which is the cost involve in the day to day financial operation and service delivery. The second is asymmetry information, which is the knowledge that a party (borrower) may possessed about the transaction that the other (lender) is not privy to. Lenders must feel convinced that their money is in the save hands before they relinquish their funds to the financial institutions.

These costs are directly proportional to the number of individual bilateral contracts, hence it is aalso costly to engage in a number of individual transaction. To reduce these costs, Savings may be pooled within intermediaries, where resources are entrusted by lot of investors to be invested in different number of firms (Sirri and Tufano, 1995 p. 83). Reasonably for this take place, financial institutions must be able to convince the depositors on how sound and genuine the investment is (Boyd and Smith, 1992). Intermediaries therefore must be worried on establishing goodwill and reputations, so as to attract lot of savers since that will make savers comfortable in entrusting their excess funds to them. (Lamoreaux, 1995).

Effective and efficient mobilization of excess funds from the system by financial institutions can strongly influence economic development through improved increased savings, taken advantage of economies of scale and also escaping investment indivisibilities. Savings mobilization has direct effect on capital accumulation as shown in macroeconomic growth theory, it also increase the resources available for allocation and improve technological innovation as well. With only few investor's available, production does not reach the most efficient scale because many production undertakings requires a lot of capital injection which is mostly beyond the capacity of an individual investor. (Sirri and Tufano, 1995).

2.2.2 Resource Allocation

To be able to allocate capital in an efficient manner, financial institutions must have reliable and adequate information to rely on but this is a difficult task due to market inefficiencies. Acquisition and dissemination of this information involves cost and encourages the set-up of financial intermediaries since neither savers nor borrowers will be ready to borne out the cost directly or consciously. Under circumstances fixed costs are involved in the acquisition of the information, individual investors will have to settle for the full cost as put forward by Levine (1997). The alternative which is relatively cheaper is where a number of investors come together to pool their resources. This reduces the average cost incurred by member investors relative to the individual investors. This calls for the involvement of financial institutions or intermediaries.

Improvement in the efficiency of acquiring information on all economic agents in financial services and administration will undoubtedly influence economic growth as this information ensures that the most efficient and productive sectors acquire the chunk of the resources raised by financial intermediaries (Greenwood and Jovanovic, 1990). Financial institutions can also increase the rate of innovation and technological advancement by channeling resources to competent entrepreneurs that are more likely to successfully introduce and sustain the new production of goods and services (King and Levine 1993b; Galetovic 1996; Blackburn and Hung 1998; and Morales 2003).The production of information is a classical attribute of stock market the stock market. Investors seeking to invest in firms will search for information about them before investing especially when the market is very big and liquid since the more information possessed, the more profit is likely to be earned (Grossman and Stiglitz 1980) and more liquid (Kyle 1984; and Holmstrom and Tirole 1993). This make a lot of sense in markets that large and highly liquid because a player who acquired information privately will covertly

use it to make money by engaging in trade on the stock market. Therefore the larger and more liquid the stock market is, the greater the impetus to create this important information that has the tendency to positively influence the allocation of capital (Merton 1987). A worthy point to note is the fact that, information that could be derived depends largely on the efficiency of the market. Frimpong (2008) made it clear in his findings that the Ghana Stock Exchange is weakly inefficient (information is costly and not easily accessed, therefore an investor will have to invest to acquire information).

2.2.3 Exerting Corporate Governance and Monitoring

The relevance of corporate governance when it comes to finance and economic growth cannot be said to be overestimated. In corporate world, the extent to which investors in debt and equity market can monitor the activities and have influence on how firms use the funds raised has an effect on savings and resource allocation. With investors and shareholders having influence on firm's decision in allocating resources efficiently, savers are encouraged to relinquish their excess funds for production. The financiers usually come out with the financial arrangement used in for the process of mitigation. Debt contracts is one of these arrangements, (Williamson 1987 and Watson and Head 2010) used by long-term creditors. Also, in a liquid market, equity-holders can easily liquidate their stocks and can exercise control through voting in an organization with their feet (Watson and Head, 2010). Corporate control may further be promoted by Stock market (Jensen and Meckling, 1987).Compensations of management can be link to stock prices under performance-related incentive schemes, that is managerial compensations can be linked to stock prices by owners (Watson and Head 2010).

A vibrant financial intermediaries has the ability to influence the growth of an economy through improved corporate governance. There are research works that has shown that indeed financial

intermediaries has influence on economic growth. A work by Bencivenga and Smith (1993) for instance has shown that so far as corporate governance is improved by financial intermediaries through the reduction of cost in monitoring, then credit rationing will be reduced and hence improved productivity, accumulation of capital, and ultimately leads to growth. Another work by Sussman (1993) and Harrison, Sussman, and Zeira (1999) found that intermediaries facilitate the flow of excess funds from savers to borrowers in an imperfect market (information asymmetry) that has a positive implication on the growth of an economy.

2.2.4 Risk Control or Management

There is a great risk when it comes to the flow of excess funds from savers to borrowers. The fact that one party in a transaction may be privy to a relevant information that the other may not possessed (asymmetry information) leads to under or overestimation of the true cost of the transaction. These costs are mitigated by financial intermediaries through the use of special instruments like hedging, trading and risk pooling. These risk mitigating instruments has an implication on allocation of resources and growth. Three different types of risk were identified by Demirguc-Kurt and Levine (2008) and these are liquidity risk, cross-sectional risk diversification, and inter-temporal risk sharing.

Cross-sectional risk was defined as the individual projects, firms, industries, regions, countries, etc (Demirguc-Kurt and Levine,2008). The risk that comes with countries, regions, industries, firms and individual projects may be managed by financial systems. Most Financial institutions like Banks, mutual funds, and securities market provide risk management (trading, diversifying and pooling risk) instruments that cushion savers. These risk management strategies use has the potential of increasing economic growth through improved savings and allocation and of resources. This is reasonable as every saver will like to escape risk although higher risk

undertakings reward much more. Therefore financial markets making it possible and easier to manage risk create an investment portfolio with higher reward (Gurley and Shaw 1955; Patrick 1966; Greenwood and Jovanovic 1990).

Liquidity is basically how fast financial instrument can easily be converted into cash at a determined prices. The risk associated with converting this financial instrument is called liquidity risk. Liquidity can be hampered by cost of transaction and asymmetry information. These imperfections incentivized the spring up of financial intermediaries to manage the risk (Demirguc-Kurt and Levine 2008). Liquidity has a link with economic development due to the fact that because a number of higher return investment tend to lock up funds for a long period of time, but a considerable number of savers are not ready to part ways with their funds for a long period of time. Therefore in order to encourage more long term investment, financial institutions must make the investment highly liquid. The major cause of England's industrial revolution for instance was attributed to the eradication of liquidity risk due to the growth in capital market (Hicks, 1969). He also argued that the early decade of the industrial revolution saw a manufactured product that was in the past invented. However growth was ignited by a critical innovation called capital market liquidity in 18th century England (Hicks 1969). Capital markets that are liquid encourage savers to hold assets that are liquid (like bonds, equity, demand deposits) since they can easily convert their savings. At the same time, financial instrument that are liquid is converted into capital investment of longer term. Thus, financial revolution where large capital is committed for long period is critical for industrial revolution (Bencivenga, Smith, and Starr 1995).

Bencivenga and Smith (1991) found out that liquidity risk and economic growth are correlated negatively. Thus growth is attain through the minimization of liquidity risk which increases high-return investment and investment in illiquid assets. They backed their findings by

explaining that, liquidity management, liquidity risk mitigation are practiced by financial institutions and this has influence on economic growth. For instance, Banks may offer deposits that are liquid to fund owners and undertake a mixture of liquid, low-return investments to gratify demands on deposits and illiquid, high-return investments. Complete insurance against liquidity risk is provided to savers through the provision of demand deposit and the selection of balanced mixture of illiquid and liquid investment by banks.

2.2.5 Exchanging Goods and Services

The operations of financial systems has the tendency to promote division of labor, new technological innovation and economic growth. This is so because, financial intermediation lowers transaction cost. A work by Adam Smith published in 1776 titled, *Wealth of Nations* was centered on the connection between facilitating transactions, specialization, innovation, and economic growth. His argument was that, productivity improvement is principally influenced by division of labor and that greater inventions of production processes is most likely as a result of high specialization (Smith 1776, p. 3). The work was keen on the role money play in reducing cost of transaction, inducing higher labor division, and improving technological innovation. The cost of information can also trigger money emergence. Barter trade is very expensive due to high cost of evaluating the goods attributes hence the need for an emergence of alternative medium of exchange (King and Plosser 1986; and Williamson and Wright 1994). An economy shifting to Money which is an alternative to barter cause a reduction in cost of information and transaction albeit not a one-time fall.

Greenwood and Smith (1996) developed a model showing the link between exchange, specialization, and innovation. Every single specialization comes with transactions which is very costly. Therefore financial package that reduces the cost of transaction will make room for

more specialization. As a consequence, the promotion of exchange by any market improve productivity gains. A feedback effect is evident here as these productivity gains may cause financial sector development.

2.3 The Financial Sector of Ghana

The study tried to review the financial sector's state in Ghana in this section. The review covers the period before the financial sector reform and the period after. Emphasis was placed on financial depth, reforms that took place and the state of the sector.

2.3.1 Ghana before the Financial Sector Reform

The financial sector in Ghana switched from a conservative policy regime to a liberalized regime which forms part of conditions proposed by the International Monetary Fund in 1980's. This move saw a remarkable improvement from what existed previously before the beginning and implementation of the reforms in 1988 (Adu, Marbuah and Mensah 2013). The banking industry has been the dominant sector in the financial sector for a very long period of time in Ghana. Aryeetey et al (2002) accordingly, explained financial development to mean allocation of mobilized financial resources in an effective and efficient way to prioritize development of the real sector. The sector before the reform was marred by inefficiencies and financial repression 'with the sector failing to channel funds to the most efficient growth driven sectors of the economy like manufacturing and agriculture. This is so because the sector in Ghana was flout with so many Government interventions especially after the independence. In the 1960's all the way to the middle of 1980's, the sector's performance was very poor due to poor savings mobilization and less, inefficient allocation of credit to economic sectors. This weakened the economic fundamentals with a devastating effect on economic growth. Theoretically the scenario fits the McKinnon and Shaw (1973) postulation of financial repression, thus the

consequences of Government arbitral intervention, restrictions and direct influence in the administration of the sector is inefficient and less developed financial system.

Government determined policies like the interest rate ceiling hindered the growth of the economy through less investment in the private sector, dis-incentivized savings and inhibited financial deepening in Ghana. Ghana Commercial Bank (1953),

Less productive economic sectors in the country were given special attention by three established state banks (Agricultural Development Bank (1965), National Investment Bank (1963) and Bank of Housing and Construction (1973)) superintended by the Bank of Ghana (1957), through channeling of credit to them using a policy mix combination of interest rate, interest rate ceilings and selective credit control (Aryeetey et al. 2000).

2.3.2 Reforms of the Financial Sector in Ghana

The financial and monetary policies that were implemented during the 1960's all the way to the 1970's failed to improve the mobilization of resources needed for the growth of the economy. This was evident in the early 1980's with a financial system deeply repressed making little room for deepening the sector. The consequences of these poor policies were obvious as the performance of financial depth indicators had fallen. An example is M2 to GDP which fell at 12% in 1984 from 1977's 24%. During the same period, real interest rate recorded was negative. Financial indicators like savings and time deposit, demand deposit and domestic credit all were declining during this financial regime of control. Domestic credit fell from 38.8% to 15.6%, savings and time deposit dropped from 7.1% to 2.6% and demand deposit also declined from 11.6% to 4.6% (Aryeetey et al. 2000). Much of these effect of the financial policies implemented on the economy was captured and documented (Aryeetey et al. 2000; Bawumia 2010).

In trying to arrest these economic debacle, the country in fulfilment of conditions set out by the Bretton woods institutions came out a macroeconomic package aimed at reforming the financial sector. The program were dubbed Financial Sector Strategic Plan (FINSSP) and Financial Sector Adjustment Program (FINSAP).

2.3.2.1 Financial Sector Adjustment Program

This policy is a comprehensive reform program at the macroeconomic level created by the World Bank and International Monetary Fund aimed at restructuring and liberalizing the financial sector of a country. This program (FINSAP) was designed and implemented in Ghana in 1988 by the then Rawlings regime. The program restructured seven banks that were distressed and malfunctioned with the clean-up of their non-performing assets to re-instilled viability and profitability of the system (Aryeetey and Gockel 1991; Brownbridge and Gockel 1996). The other tools employed in the program are the official end to direct credit control, begun the structural reformation through monetary and fiscal policy, good price setting, privatization of considerable number of banks, to improve supervisory and regulatory framework, to develop the capital and money market which saw the Ghana Stock Exchange been established in 1990 (Bawumia 2010).

The foundational theory on which the financial reform was based on was the financial clampdown or repression theory stated earlier by McKinnon and Shaw in 1973. The reform was undertaken to enhance economic growth through the clampdown of repression in the system. Five objectives were aimed to be achieved by the reforms; The first one had to do with alleviation of repression in the financial sector by interest rate liberalization (the market allowed to determine the price of money) and abolishing allocation of administrative credit; the Second objective was to initiate and institute the shift to indirect rather than the existing direct monetary

policy; Banking system restructuring and improvement in the solvency of banks was the third objective; The Fourth was financial markets development in its entirety, primarily treasury bills markets as well as markets for stocks and bonds and the fifth and final objective was to solidify the regulatory environment made up of supervision of banks, develop financial markets in general, mainly primary markets for treasury bills, and other markets for bonds and stock markets and Finally to strengthen the regulatory environment including bank supervision, accounting and auditing practices (Ncube and Senbet 1997; Camen et al. 1997).

2.3.2.2 Financial Sector Strategic Plan

For the gains made earlier from the financial sector adjustment program to be consolidated, In 2001, the financial sector strategic plan (FINSSP) was largely implemented. The program had similar objectives to the FINSAP implemented earlier and also, the sector was deepen with better service delivery in the financial sector (Bawumia, 2010). The FINSAP and FINSSP implementation processes both had a positive and significant effect on the banking industry and the financial system as a whole. For instance the number of banks in the system rose significantly to 27 in 2009 with branches, 696 (most of the investors are foreigners) from the existing 10 in 1988 with branches, 405. The growth in banking system was evident as assets in the banking sector also grew from 0.31% of GDP in 1993 to 0.66% to GDP by 2008 (Bawumia, 2010)

Albeit significant improvement in important financial indicators such as Savings or deposit mobilization, liberalization of interest rate, Credit allocation to sectors, Capital adequacy, Concentration of quality assets and indicators of financial depth capital adequacy, savings mobilization (deposits) and sectorial credit allocation, interest liberalization and financial deepening indicators after the FINSAP and FINSSP implementation, there was still a major issue with non-performing loans. Credit extended to private sector was higher than that extended to the

public sector for not less than a decade. The average rate between the period 1981 to 1990 was 3.12% and 15.71 % in 2010 (Bawumia, 2010).

After the financial sector reform, a data available showed an improvement in key financial depth indicators resulting in a deepened financial sector over decades in the past. Broad money supply to GDP ratio ($M2+/GDP$) rose to 31.5% between 2001 to 2005 from the 16.50% between 1981 and 1990 and fell in 2010 to 29.7 (Bawumia, 2010). Domestic credit to the private sector to GDP ratio also increased to 5.9% (from 1984 all the way to 2000) from the lowest percentage in 1983's 1.5% and rose significantly to 14.1% over 2001 to 2012 (World Bank, 2013).

These indicators of financial deepening continued to improve marginally over the past decades, much particularly during the immediate periods that follows the financial sector reform. The effect on real interest rate could not suddenly transform it to positive after the FINSAP and FINSSP implementation. The average rate of real savings rate between the periods 1988 to 2001 was -10 and that of the period between 2000 and 2008 rose to -8.8. The average rate banks real lending rates was in contrast positive with 9.1% in 1989 to 22% in 2000 and the average rate between 2001 and 2008 was 9.1 (Bawumia, 2010). The gap between the rate of lending and savings rate called the interest rate spread was of great concern to industry stakeholders. However, the implementation of the economic recovery program, financial sector adjustment program and financial sector strategic plan improved the growth rate of the economy. Using a 2005 United States dollar value as the base, the average per capita GDP was \$456 between the years of 1960 to 1982, but fell in 1983 to \$321. Gross Domestic Product (GDP) in 1984 all the way to 2000 increased to \$390 and rose further from 2001 to 2012 to peak at \$550 (World Bank, 2013). What is evident from these review of the Ghana's financial sector is that, albeit the undoubted improvement in the financial system of the country which impacted

positively on the overall growth of the economy due to the initiation and implementation of ERP, FINSAP and FINSSP, more work has to be done to further consolidate and improve the sector.

2.4 Financial Deepening

The financial sector during the pre-reforms was repressed causing a marginal decline in the financial deepening indicators. For instance a report by the World Bank (2013) indicated that M2 to GDP ratio growth was comparatively steady at 21% from 1964 to 1974, then went up for some time in the middle of 1970s, peaked at 29% in 1976 and strongly fell to 11.3% in 1983.

Aryeetey and Gockel (1991) examined the Ghanaian informal sector of the financial system and found out that street banking was relatively increasing compared to the formal form of financial intermediation. The retrogressive growth in the nominal deposit rate between the period 1978 to 1983, real deposit rate (11.5% averaged) and high inflation with an average rate of 73 was a contributing factor to the decline in financial deepening indicators creating fear in possessing financial asset(World Bank, 2013).

Quartey (2005). Domestic credit to private sector as a percentage of GDP averaged at 7% from the period 1960-1978; during the freezing of accounts and appropriation of currency, the ratio fell further to 2.2%. The ratio fell to its record low in 1983 that is 1.5% (World Bank, 2013). The banked were demotivated and discouraged from active banking (cash deposits) due to long waiting hours in the bank resulting from inefficiency and inadequate currency or bank notes. The banks had their shares, as interest rate control demoralized them from mobilizing much deposit from the public while the small deposit mobilized could not be invested in remunerative outlets because of liquid asset requirement and statutory reserve.

(Quartey, 2005).The public lost confidence in the system by relinquishing and exchanging home currency to the foreign currency and the use of banking system in the country due to the 1979, 1982 currency appropriation policies, freezing bank accounts as well as decree allowing government to have access to customers' bank accounts details in case it is needed. Such happenings in the system encouraged the public to seek financial services from the informal sector and acquisition of physical assets like construction materials and buildings. Some also acquired foreign assets)

2.4.1 Broad Money Supply to GDP Ratio

This is money supply (money and quasi money) as a percentage of gross domestic product. According to the World Bank “ Money and Quasi Money comprises the sum of currency outside banks, demand deposits other than those of the Central Government, savings deposit, and time deposit and foreign currency deposits of resident sectors other than the central government”. A World Bank (2013) report indicated that M2 to GDP ratio growth was comparatively steady at 21% from 1964 to 1974, then went up for some time in the middle of 1970s, peaked at 29% in 1976 and strongly fell to 11.3% in 1983.

Basic economic theory espoused the relationship between money supply and the GDP. A rise in money supply is expected to lower interest rate (price of money) leading to higher consumption and lending activities all things being equal. This should in the Short run increase spending and output and presumably GDP.

An increased in the Gross Domestic Product also has an impact on money supply. GDP is a rough representation of an economic productivity and health. A rise in GDP raises the level of economic activity and this increases the value of the money in circulation since same unit of currency can be used to acquire more valuable goods and services. This therefore reduces

inflation even without a rise in the money supply. A classic example is the case with rising technology, where prices of technological items like phones keeps dropping due to fast rise in technology.

2.4.2 Domestic Credit to Private Sector as a Percentage of GDP

This simply is the total amount of money or resources mobilized within the country that is extended to the private sector expressed as a percentage of the Gross Domestic Product. The World Bank defines this indicator as financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks) such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises.

According to a data from the World Bank, domestic credit to private sector as a percentage of GDP recorded its lowest value (1.54%) in 1983 and highest ever was recorded in 2014 at 19.89%. From the data, the indicator experienced a relatively higher and stable rise from the period 1999 all the way to 2014. All the years for instance recorded a percentage point above 10 with 2008, 2013 and 2014 recording the highest point of 15.83%, 16.07% and 19.89% respectively.

A country that is experiencing a sustained rise in this financial depth indicator *ceteris paribus*, is on a trajectory of improving economic growth and development. This is intuitively so because, rising domestic credit to private sector as a GDP percentage means, increasing domestically mobilized financial resources that is extended to the private sector. More funds in the hands of the private sector stimulate growth through a rise in GDP. This is so not only to the fact that the private sector is a component of aggregate demand but because the sector is seen by economist

(especially capitalist) as the engine of growth due to its ability to create employment, produce goods and services utilized by households and to some extent firms and ultimately increase aggregate demand.

2.5 Agricultural Sector in Ghana

Agriculture is a vital component of economic growth because it serves as the production base of an economy. The output serves as raw material for industries, ensure food security, improve foreign exchange and creates employment. In most African countries, agriculture which is highly labor intensive contributes significantly to GDP growth. Ghana is not left out of this phenomena, for instance, from the period 1950 to 1960, output from the agriculture sector grew by 4.3% annually which exceeds the growth of the GDP (at 4.1 annually). The average output from cocoa, an export crop from the period 1955 to 1960 rose to 9%, 5.7% for agricultural output and 5.1% growth for GDP. A rise in output of export crop (cocoa) led to an average rise in foreign exchange earnings at 3.2% annually with export annual growth of 3.2% while imports and gross domestic investment both growing annually at 8.9% in the 1950's (Issahaku,2012)

Agriculture sector has been the dominant contributor to GDP for more than a decade beginning in the 1950's. For instance, in 1957, the country achieved the highest per capita income coupled with very low inflation becoming one of richest in sub-Saharan Africa. It was and still the leading sector that employs relatively the chunk of labor force. In 1955, it was the major source of income and wealth to citizens and the nation as a whole contributing close to an half of GDP with larger citizens depending on the sector relative to today (Issahaku, 2012).

Unexpectedly, the post financial sector reform which saw a rise in the number of banks could not increase the annual growth rate of the Agricultural sector, the sector rather shrunk with a decline in marginal output. Data from WDI shows that, the average contribution of agricultural value added to GDP in percentage terms between 1961- (pre-financial sector reform) was 52% approximately while average value for period after the financial sector reform (1988 to 2014) was 39% approximately. The period that recorded the highest agricultural value added as a share of GDP was 1978 at 66% followed by 1979, 1977, 1980 and 1982 at 64%, 61%, 61% and 60 percent respectively. The sector contribution to GDP started experiencing a serious decline in 2006 (from 41% in 2005 to 32% in 2006) and this continued fall annually, with current value of 22% in 2014.

2.6 Financial Development and Economic Growth Linkage

The finance-growth nexus has received much attention in theoretical and empirical literature due to its implications for development policy (World Bank, 1989). The theory underlying this relationship dates back to the writings of Schumpeter (1912) and, more recently, to McKinnon (1973), Shaw (1973) and their followers (Kapur, 1976; Galbis, 1977; Fry, 1978, 1980, 1988; Mathieson, 1980). The most dominant arguments were those put forward by McKinnon (1973) and Shaw (1973).

The key policy implication of the McKinnon-Shaw thesis is that government restrictions on the banking system, interest rate ceilings, high reserve requirements and directed credit programmes—hinder the process of financial development and, consequently, reduce economic growth. The endogenous growth models had similar conclusion. These models suggest that financial deepening has a positive effect on steady-state growth (Greenwood and Jovanovic,

1990; Bencivenga and Smith, 1991) and that government intervention in the financial system has a negative effect on the growth rate.

2.7 Empirical Literature on Finance development, Agricultural Output and Growth

2.7.1 Finance-led Growth

A study by King and Levine (1993) to look at the links among financial development indicators and the growth of an economy presented an evidence from cross-country that is in tandem with Schumpeter's view of financial system being able to induce the growth of an economy. The results of this study showed that various financial development measures were profoundly related with real GDP per capita growth, rate of accumulation of physical capital, and improved efficiency in physical capital employment. Also, an established financial development component is strongly related with future economic growth rate, accumulation of physical capital, and as well as advancement in the efficiency of an economy.

Abu-Bader and Abu-Qarn, (2005) tested the relationship and causation effect of financial development on growth of Egyptian economy during 1960-2001 period. They applied Granger causality tests using the cointegration and vector error correction methodology. Their study outcome significantly attested to the stance that a developed financial sector Granger-causes economic growth through a rise in efficient investment or by a rise in investment resources.

2.7.2 Growth-led Finance

Waqabaca, (2004) assessed the finance-growth correlation employing a 1970-2000 time series data in Fiji. Applying co-integration and unit root analysis within a bivariate vector autoregressive (bVAR) framework, the results revealed a positive finance-growth correlation for Fiji

with economic growth predominantly causing financial development. The outcome is in tandem with findings from countries with less sophisticated financial systems.

Odhiambo (2008) examined the financial deepening and growth of Kenya's economy causal relation with savings included as an intermitting variable—hence created a simple trivariate model causality. cointegration and error-correction analysis carried out, the study results showed that there exists a unique unidirectional causal flow from the growth of the economy to development of finance. It also revealed that economic growth Granger causes savings, while savings serves as an impetus for development in Kenya's financial sector.

2.7.3 Finance and Economic Growth Feedback Causation

Luintel and Khan (1999) examined the finance-growth nexus in the long-run using a multivariate vector auto regression (VAR) model with ten countries as sample size. Their study outlined the shortcomings resulting from regressing cross-country as well as bivariate time series analysis. The finance-output nexus in the long run was realized in a cointegrating model by testing of restrictions that are over-identified. Their results showed that a causality of bi-directional nature in the finance-growth nexus in all the countries that were sampled.

Akinboade (1998) tested the correlation as well as causation between development in the financial system and the growth of an economy for the period 1976-1995 in Botswana and found out that there is bidirectional causality between them.

2.7.4 Finance and Agriculture.

Credit use as a regressor in an agricultural production function has been disputed by researchers (Discoll,2004, P.469 & Nkurunziza, 2010, p. 489).Other researchers however argued that, inputs

like fertilizer, biocides, weedicides, tractors and seeds bought by credits are crucial in the production of agricultural output.

The argument against the use of funds as an independent variable or regressor in a production function stemmed from the understanding that, credit only affects output indirectly and not directly by reducing the constraints in purchasing production inputs through the use of funds. (See carter, 1989).

An argument put forward by Carter in 1989 in favour of credit as haven an influence on agricultural output show three different ways that credit can have an influence on Agricultural output. First was that credit ensures that the allocation of resources is not only done efficiently but is also optimally used? The second was that farmers will move a new production frontier if the funds are used to acquire highly sophisticated machineries and thirdly the use of fixed input like management, land and so on can be intensified with credit availability.

Afangideh (2009) uses a three stage least square estimation technique to establish the various tubes that financial development is transmitted through to the agriculture subsector as well as the effect of financial development on agricultural sector. The findings from the empirical work shows that bank lending to agriculture has real impact on savings and agricultural output.

Lodhi and Khan (2014) uses a vector auto regressive model and a data between the period 1980-2012 in Pakistan to establish a correlation among financial depth, trade openness, agricultural raw material export and economic growth.

Chiasa (2014) uses a structural equation model approach to examine how finance affects agricultural sector using data in South Africa. The empirical results shows the nature of the debt do affect farmers' output.

A work by (Dehejia and Muney, 2007) in the United States shows that financial development (growth in bank branching and intermediation) has negative impact on farming.

2.7.5 Closing Remark

This paper however will use an important financial development indicators, M2 to GDP and domestic credit to private sector to GDP ratios to explore their effect on Agriculture sector in Ghana. Three different econometric model; Fully Modified Ordinary Least Square, Canonical cointegration and Autoregressive Distributed Lag (ARDL) model will be used for impact analysis to ensure robustness, and to determine the trend dynamics in the variables as well as their relationships. The variables were unit root tested using the Augmented Dicker-Fuller test (ADF) that is a test to check the hypothesis that an observable time series is trend stationary. Dummy variable were also introduced in the equation in order to determine the effect of structural breaks on the results. Eviews 9.0 and other relevant computer software were used for the analysis.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Proxies used as financial development to assess how development in the financial sector affects real activities in an economy varied from researcher to researcher. The financial development indicators employ in empirical works can be merged into three broad classes: stock market indicators, monetary aggregates and structural and institutional indicators. This work will use an indicator from monetary aggregate indicators (M2 to GDP and Domestic credit to private sector to GDP ratios) which are stochastic in nature as proxies for financial development.

The choice of these indicators is due to how closely related they are to the sector under study. The Agricultural sector in Ghana is largely private, with a lot of small scale investment. This makes Domestic credit to private sector as a fraction of GDP (total internal resources extended to the private sector as a GDP percentage) an important indicator in explaining agricultural growth. The choice of broad money as a fraction of GDP as an indicator will help us determine to what extent, is the growth of agriculture in the country been influenced by amount of money (currencies and deposits in the bank) issued in the system. This is considered because, intuitively, higher M2 to GDP ratio all things been equal has the tendency to increase total savings, hence raise total domestic credit and consequently a rise in credit extension or allocation to the real economic sectors.

The stock aggregate was not considered in this work because, the agricultural sector in Ghana is not directly affected by the activities of the stock market and not even a single Agricultural production firm is listed on the Ghana Stock Exchange as at now. Although the consequence of

a bullish stock market affect almost an entire economy, its effect on this sector is indirect and yet still insignificant.

This work will employ a secondary data. Data on 5 indicators namely M2 to GDP ratio, Domestic credit to private sector to GDP ratio, Agricultural machinery and tractors which will be expressed in terms of agricultural land area, Rural Population per total population and Agricultural value added per GDP spanning from 1961-2014 will be derive from the World development indicators (WDI).

3.1 Model and Definition of Variables

3.1.1 Empirical Model

Afangideh (2009) work in determining the effect of financial sector development on Agricultural investment using three stage least square approach in the Nigerian economy developed a small macroeconomic model based on the nature of the economy he was studying. His model was specified as follows:

$$EAGEXP_t = \delta_0 + \delta_1 BDI_{it} + \delta_2 SMI_{it} + \delta_3 LRI_t + \delta_4 AGY_t \quad (3.1)$$

His model states that investment in the agricultural sector is explained by financial sector development (BDI_{it} and SMI_{it}), lending rate (LRI_t) and agricultural output (AGY_t).

Based on the Ghanaian agricultural sub-economy, the researcher also developed a multiple regression model. The model is as follows:

$$\log AV_G = c(1) + c(2) * \log M2_G + c(3) * \log dcp + c(4) * \log am_{al} + c(5) * \log rp_{tp} + \varepsilon \quad (3.2)$$

(3.2) states that agricultural value added per GDP is a function of financial development (Broad money supply as a fraction of GDP, $\log m2_g$ and Domestic credit to private sector as a fraction of GDP, $(\log dcp)$, Agricultural machinery and tractors per Agricultural land and rural population as a fraction of total population all expressed in Log.

The expected signs of proxies for financial development coefficients, $c(1)$, $c(2)$, are positive. The positive sign for these coefficients is due to the understanding that developed and efficient financial sector, leads to increased savings mobilization and hence an opportunity is provided for more credit to be disburse to harnessed more Agricultural sector investment opportunities which raises output.

The expected signs for the control variables coefficients; $c(3)$, $c(4)$, are positive. The expected signs are positive because, first, because land is considered fixed (data on agricultural land from the WDI shows it is almost fixed annually), a rising number of machineries and tractors which is the numerator *ceteris paribus* is expected to increase output through a rise in scale of production and efficiency. Secondly a rising rural population per total population all things being equal is expected to increase agricultural output since the sector is highly dominated by rural folks.

3.1.2 Empirical Model with Structural Break Adjustment

The model above is adjusted for a possible structural break due to the major reform that took place in the 1980's (Economic Recovery Program in 1983 but FINSAP, one of its components was specifically implemented in 1988) which fell within this research sample (1961-2014). The reform was basically based on the McKinnon-Shaw theory (1973) which propounded that, a liberalized financial sector improve economic growth. The deregulation had to do with non-strict control of the sector by Government, allowing the market forces to determine price of

money (interest rate) and so on. Researchers have demonstrated in their study how the reform had impacted positively on the overall economy by increasing the number banks, the stock market improvement, financial deepening and growth. (See for instance Bawumia, 2010 and Aryeetey and Gockel, 1991).

To account for this effect, the researcher introduced a dummy variable (financial sector adjustment programme) into the empirical model above (3.2). The model then becomes:

$$\log AVG = c(1) + c(2)*\log M2G + c(3)*\log dcp + c(4)*\log am_{al} + c(5)*\log rp_{tp} + c(6)*dfinsap + \varepsilon \quad (3.3)$$

Where $dfinsap = 1$ after 1987 and 0 before 1987.

3.2 Estimation Techniques

3.2.1 Unit root test

This is a test the researcher carried out to ascertain whether the time series data is stationary or not. Stationarity is one of the properties of random processes or observations. A time series data is said to be stationary when it has a constant mean, or variance or both over time. A random equation devoid of drift model is not stationary and this cause a unit problem. A trending independent and dependent variables (non-stationary) gives a spurious results since a variation in dependent variables cannot be attributed only to a change in the explanatory variables. The stationarity of a time series data is relevant because correlation could persist in non-stationary time series even if the sample is very large and may result in what is called spurious (or nonsense) regression (Yule, 1989). However this problem can be eliminated by differencing or

detrending the data set. According to Wei in 2006, the problem of unit root can be addressed by data differencing. To address this problem that arose from the non-stationarity of the data set, there are so many tests that can be used, but the researcher adopted the Augmented Dickey Fuller (ADF test) for the unit root test. This test also corrects for auto correlation. In the ADF test, the lags of the first difference are included in the regression equation in order to white noise the error term effect.

3.2.2 Co-integration

This test is carried out to ascertain whether or not the economic variables under study are related in the Long-run. Variables that are co-integrated moves together and never departs, therefore altering one of the variables affects all the other variables immediately and continuous to do so even in the future. Theory has it that, variables integrated of order one (1) may be co-integrated. In cases, where the combined variables under consideration are integrated individually or independently of the same order with at least a single, stationary linear combination, then the variables in question are co-integrated. However variables that are not co-integrated implies that, those variables are only related in the short run. This study considers Johansen co-integration test.

To determine of what order were the variables integrated led to the use of the Augmented Dickey-Fuller unit root test. The test was carried out at both level and 1st difference. If the test at level shows all variables to be stationary, then the variables are said to be integrated of order zero ($I(0)$) while if they are stationary at 1st difference, then they are integrated of order one ($I(1)$). ARDL approach will be used because the variables were neither $I(0)$ nor $I(1)$. The equation estimated for the augmented Dickey-Fuller (ADF) test is stated as follows:

$$\Delta X_t = \alpha + \beta t X_{t-1} + \sum_{i=0}^n \theta_i \Delta X_{t-1} + \varepsilon_t \quad (3.4)$$

Where Δ is the first difference operator, t is the time trend, ε is the stationary random error and n is the maximum lag length.

3.2.2.1 ARDL Model/ Bound Testing.

The bound test (Wald test) was carried from the VAR linear regression estimates. The coefficients are restricted followed by commas and with a pressed on ok, the results pop out. The F-value or p-value generated from the bound test is use for decision making by comparing it with critical values of Pesaran (2001) critical values for bound test and 5% significance level respectively. ARDL model is an abbreviation for autoregressive distributed lag model used for testing the short and long run relationship between time series data variables that are mixed in stationarity and non-stationarity. Here the model is constructed to include the lagged of the dependent variables. Thus the explained variable is partly explained by its successive lagged component. I employed this model because some of the data on the variables are stationary and whiles some are non-stationary. The ARDL model in its basic form is as follows:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \dots + \beta_n y_{t-n} + \gamma_0 + \gamma_1 x_{t-1} + \dots + \gamma_n x_{t-n} + \varepsilon_t \quad (3.5)$$

Where y_t is the dependent variable explained by its lagged value and the lagged of the explanatory variable, x_t . ε_t is the stochastic error term.

Including lot of the lagged component of the explanatory variables causes multicollinearity. This was addressed by restricting the distribution of outcomes or values that the regressors

coefficients takes. The ARDL linear regression for the dependent and independent variables in this work is given as:

$$\log AV_G = \beta_0 + \beta_1 \log M2_G + \beta_2 \log dcp + \beta_3 \log am_{al} + \beta_4 \log rp_{tp} + \beta_5 \log AV_G(-1) + \varepsilon$$

(3.6)

That is Agricultural value added as a fraction of GDP is partly explained by its lag component. This also solve for serial correlation. Residual test was carried out to check for serial correlation homoscedasticity, heteroscedasticity and normality.

3.2.3 Fully Modified Ordinary Least Square (FMOLS) and Canonical Cointegration

In order to ensure robustness or certainty in the test for finance-agriculture per GDP correlation , another two different but asymptotically similar estimation techniques were employed and these are the fully modified ordinary least squares(FMOLS) and Canonical Cointegration regression. The FMOLS and Canonical Cointegration were developed originally by Phillips and Hansen in 1990 and Park in 1992 respectively. The two are very efficient estimates that addresses the Second order problem and are also very potent to autocorrelation and endogeneity problem. These, it does so automatically. Endogeneity is correlation between regressors and error term and this leads to spurious or nonsense regression. Although these two cointegrating regression are different in terms of correction approach, they are nonetheless considered similar asymptotic. The FMOLS according to Philips and Hansen, 1990 is a semi-parametric instrumental variable estimate designed to eliminate the second order problem. Even in the absence of level relationship among variables, the fmols is known to be robust and gives efficient and consistent estimates from stationary and non-stationary series (Phillips and Hansen, 1990). FMOLS also fully transform the variables or data before it estimates the regression.

Given say (y, t) has $n+1$ dimension with the assumption that all the variables are I (1), then it can presented in a cointegrating form in a triangular form. (9) and (10) shows that:

$$y_t = x_t' \beta + D_{1t}' \gamma + u_{1t} \quad (3.7)$$

$$\Delta y_{2t} = \varepsilon_{2t} \quad (3.8)$$

It is assumed that the residual, $\varepsilon_t = (u_{1t}', \varepsilon_{2t})$ is stationary in a strict sense with an expected value of zero, it is also taken to be weakly dependent with the infinite covariance matrix not block diagonal. The FMOLS seems to have advantage over the ordinary least square in that, the approach does not only give consistent estimate as the ordinary least square does, but it also transform the data to give efficient beta estimate as well. Also if we assume $D_t \square \square \square D_{1t}' \square$, $D_{2t} \square \square$ are deterministic non-stationary explanatory variables, then the X_t independent variables are governed by the following forms of equations:

$$x_t = \tau_{21} D_{1t} + \tau_{22} D_{2t} + \varepsilon_{2t} \quad (3.9)$$

$$u_{2t} = \Delta \varepsilon_{2t} \quad (3.10)$$

The FMOLS estimator uses initial estimates of the symmetric and one-sided long-run covariance matrices of the residuals. Assuming after estimating (9), u_{1t} becomes the obtained residuals, then we can derive u_{2t} directly from difference regression (14) or from (13) indirectly.

$$x_t = \tau'_{21} \Delta D_{1t} + \tau'_{22} \Delta D_{2t} + u_{2t} \quad (3.11)$$

$$u_{2t} = \Delta \varepsilon_{2t} \quad (3.12)$$

Next, assuming we let N and A represents the long-run covariance matrices that is estimated using the residuals $u_t = (u_{1t}, u_{2t})$, then the data transformed can be given as (15) and (16.)

$$y_t^+ = y_t - \omega_{12} \Omega_t^{-1} u_t \quad (3.13)$$

$$\mu_t^+ = \mu_{12} - \omega_{12} \Omega_{22}^{-1} \Lambda_{22} \quad (3.14)$$

y_t^+ and μ_t^+ are the respective terms for correcting endogeneity and autocorrelation. The FMOLS estimator resultantly is given as:

$$\rho f mol = (\sum_{t=1}^T Z_t Z_t')^{-1} \left(\sum_{t=1}^T Z_t Y_t - T \begin{bmatrix} \mu_{12}^+ \\ 0 \end{bmatrix} \right) \quad (3.15)$$

Where $Z_t = X_t, D_t$. The construction, long run covariance matrix estimators N and A is the main thing in FMOLS estimation.

3.2.4 Canonical Cointegration (CCR)

This estimator has a requirement which is, a contemporaneous covariance matrix estimate should be consistent. Here, unlike the FMOLS, the data is only transformed or modified to

choose a canonical regression from group of models that forms cointegration relationship of the same. The initial step is simply obtaining the estimates of $u_t = (u_{1t}, u_{2t})$ and also the long run covariance matrices Ω and Λ . An efficient and consistent coefficient estimate is the obtained from transformations (transformed y and x) below:

$$X^*_t = X_t - (\Sigma^{-1}\mu_2)U_t \quad (3.16)$$

$$Y^*_t = Y_t - \left(\Sigma^{-1}\mu_2\beta + \begin{bmatrix} 0 \\ \Omega_{22} \end{bmatrix} \right)' U_t \quad (3.17)$$

Hence the CCR estimator becomes:

$$\rho_{CCR} = (\sum Z_t^* Z_t^{*1})^{-1} \sum_{t=1}^t Z_t^* Y_t^* \quad (3.18)$$

3.2.5 Empirical Model for Cointegrating Regression

$$\log AV_G = \beta_o + \beta_1 \log M2_G + \beta_2 \log dcp + \beta_3 \log am_{al} + \beta_4 dfinsap + \varepsilon \quad (3.19)$$

The difference between this model and model (3.3) is the exclusion of rural population per total population. It is taken out here because the variable is not stationary even at 1st difference as were with the rest. To run cointegrating regression, all variables must be stationary or non-stationary.

3.3 Definition of Variables under Consideration

Dependent Variable	Expected Signs
1. Agricultural value added per GDP (LOGAV_G)	
Independent Variables	
1. Broad Money Supply to GDP ratio (LOGM2_G)	Positive
2. Domestic Credit to Private Sector per GDP (LOGDCP)	Positive
Control Variables	
1. Agricultural Machinery and Tractors per Agricultural Land (LOGAM_AL)	Positive
2. Rural Population per Total Population (LOGRP_TP)	Positive

3.4 Data Analysis

An econometric package, Eviews 9.0 was used for all regression and statistical analysis and estimations.

3.5 Research Design and Approach

The approach followed was Quantitative. Quantitative as to do with deriving meanings from numbers analysis through the use of statistics and diagrams. Quantity approach was defined by Burns and Grove (1993) as a formal, objective, systematic process to describe and test relationships and examine cause and effect interactions among variables. According to (Smith 1988), Quantitative research is made up of counting and measuring of events and performing the statistical analysis of a numerical body. The positivist paradigm assumed that, an objective truth exist in this world that can be scientifically measured and explained. The Quantitative paradigm

concerned itself mainly with the fact that a measurement that clearly predict a cause and effect is reliable, valid, and generalizable. (Cassell and Symon 1994).

The research design adopted for this study was descriptive research as this suit the study objective, thus investigating the correlation between variables. Descriptive research design is very excellent at providing correct attributes or characteristics of the object or variable under study. Some of these characteristics are abilities, behavior, belief, knowledge, opinions and situations. Glass and Hopkins in 1984 explained Descriptive research as gathering or collecting, organizing, tabulating, depicting and describing of data on a particular events.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This work has the following objectives; to investigate the trend in the financial development relationship with agricultural output in Ghana and to look at the effect of development of the financial sector on agricultural output in Ghana. Chapter four presents the result of the study. Unit root test for level and 1st difference was carried out using the Augmented Dickey-Fuller test, three different econometric estimation technique were used for robust purposes and these are Autoregressive distributed lag, fully modified least squares and canonical cointegration.

4.1 Descriptive Statistics of Variables used

Table 1

	LOGAV_G	LOGM2_G	LOGDCP	AM_AL	LOGRP_TP
Mean	1.637970	1.338474	0.834872	0.642798	1.795785
Median	1.653271	1.334555	0.860687	0.643467	1.815249
Maximum	1.813213	1.532860	1.299007	0.660805	1.881972
Minimum	1.350169	1.053270	0.188160	0.591928	1.668460
Std. Dev.	0.109275	0.119706	0.286045	0.011261	0.062796
Skewness	-0.891699	-0.405459	-0.419730	-1.609938	-0.531597
Kurtosis	3.495052	2.556417	2.329575	8.709363	1.989994
Jarque-Bera	7.707564	1.922294	2.596865	96.66998	4.838616
Probability	0.021199	0.382454	0.272959	0.000000	0.088983
Sum	88.45039	72.27758	45.08310	34.71112	96.97238
Sum Sq. Dev.	0.632878	0.759460	4.336543	0.006722	0.208994
Observations	54	54	54	54	54

The variables are Agricultural value added per GDP, M2 per GDP, Domestic credit to private sector per GDP, Agricultural machinery and tractors per agricultural land and Rural population per total population.

4.2 Unit Root Test

Running a regression (Generalized Least Square or Ordinary Least Square) without testing for stationarity or otherwise of the data can result to obtaining spurious or nonsensical results because a non-stationary dependent variable for instance can change not necessarily because of a change in independent variable but because time cause it to change. The use of GLS and OLS directly to trend data leads to spurious or misspecified regression results (Engle and Granger, 1987). Unit root test also help us to determine the estimation approach to use. Johansen's cointegration technique for instance is use only when all the variables are either non-stationary or stationary whiles ARDL approach and other techniques can be used for mixed results.

Table 2: Unit Root Estimate

ADF Test at Levels			ADF Test at 1 st Difference	
Variables	Constant	P-values	Constant	P – values
LOGAV_G	-0.046736	0.9879	-0.004876	0.0000 I(1)
LOGM2_G	0.120393	0.5927	0.004370	0.0000 I(1)
LOGDCP	0.035492	0.8489	0.009313	0.0000 I(1)
LOGRP_TP	-0.004556	0.9992	-0.000161	0.7406 I(2)
AM_AL	0.214005	0.0000	-0.000190	0.0000 I(0)

Table 1 presents the results of the ADF unit root test (p-values and intercept) for levels and 1st difference with I(0), I(1) and I(2) ascribed to mean integrated of order 0,1 and 2 respectively.

The results from this table shows that the unit root null hypothesis (that is trending or non-stationarity) at levels cannot be rejected based on the variables levels except log of machinery and tractors per agricultural land (AM_AL) which is stationary.

On the right hand side is the ADF test at 1st difference which indicates that all the variables except log of rural population per total population (stationary at 2nd difference) are stationary (significant at 1%) and hence we reject the null hypothesis of unit root at 1st difference.

The results above implies that all variables are neither integrated of order zero $I(0)$ nor integrated of order one $I(1)$. This is because in both the level and at 1st difference, not all of the variables were stationary (That is, at least a single variable trends with time), with this results therefore running an ordinary least square can lead to spurious results unless in special case where the variables have cointegrating relationship (that is stationary equilibrium relationships among variables in question). Stationary variables adjust to their trend level when hit by shock. The shock will only cause a temporal change in stationary variable with the variable adjusting to its original trend level in the long run.

4.3 Cointegration Analysis

Cointegration test is carried out to find out if there is cointegration existence among the variables (that is the variables tends to move together) so altering one of the variables will have a consequential effect on the other variables. Theory has it that, variables integrated of order one (1) may be co-integrated. In cases, where the combined variables under consideration are integrated individually or independently of the same order with at least a single, stationary linear combination, then the variables in question are co-integrated. However variables that are not co-integrated implies that, those variables are only related in the short run. This study

considers the Autoregressive distributed lag approach. According to Pesaran and Shin (1995), Cointegration also help researchers to find out whether disequilibrium exist in various markets.

4.3.1 Cointegration Analysis: Financial Development and Agricultural Output per GDP

4.3.1.1 ARDL Bound/ Wald Test Estimates for Cointegration

Table 3: Bound testing

Null Hypothesis: No long-run relationship

Test statistic	Value	K
F-Statistic	4.1692	5
Critical Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79
1%	2.96	4.18
2.5%	3.41	4.68

The table 3 above is an ARDL Bound test with upper, lower bound values, and F-values. The results shows that the variables are cointegrated in a long run at 5% significance level, hence we reject the null hypothesis.

Source: estimated using Eviews 9.0

The results above (cointegration) means, the variables are cointegrated in the long run. This basically implies, a change in one of the variables will result in a change of all the other variables in a form of vicious cycle in the long run.

4.3.1.2 FMOLS Wald Test Estimate

Table 4: FMOLS Estimates

Test Statistic	Value	df	Probability
F-Statistic	3690.277	(4, 49)	0.0000
Chi-Square	14761.11	4	0.0000
Null Hypothesis: c(1)=c(2)=c(3)=c(4)=0			
Normalized Restriction (=0)		Value	Std Error
C(1)		0.105586	0.181959
C(2)		-0.251855	0.080818
C(3)		2.698490	0.306053
C(4)		-0.058840	0.033658
NB: Restrictions are linear in coefficients			

Source: estimated using Eviews 9.0.

The test above is carried out to find out whether the cointegrating vector is equal to 0. The chi-square and p-value are all zero, indicating the null hypothesis that the coefficients of the explanatory variables are equal to 0 should be rejected. This implies the variables (M2 per GDP, Domestic credit to private sector to GDP, Agricultural machinery and tractors and Agricultural value added per GDP) cointegrates in the long run.

4.3.2 Impact Analysis

4.2.3.1 Table 5: ARDL Long Run Estimate

Dependent variable: LOGAV_G

Variables	Coefficients	Std Error	t-statistic	p-value
LOGM2_GDP	0.444768***	0.147518	3.015016	0.0042
LOGDCP	-0.133862**	0.060199	-2.223675	0.0312
LOGAM_AL	-6.969801***	2.864988	-2.432750	0.0190
LOGRP_TP	2.922900***	0.551632	5.298642	0.0000
DFINSAP	-.003365	0.040048	0.084020	0.9304
C	0.400164	1.385296	0.288866	0.7740

The table above (table 4) is an autoregressive distributed lag long run estimate with m2 to GDP ratio (logm2_g), agricultural labor (logrp_tp), domestic credit to private sector fraction of GDP (logdcp) and agricultural machinery and tractors per Agricultural land (logam_al) being significant at least at one of the conventional levels. The rest of the variables however are insignificant.

Source: estimated using Eviews 9.0

The results indicates that the correlation between M2 as share of GDP (LOGM2_G) and Agricultural value added as a share of GDP (logav_g) is direct with a coefficient value, (0.445). This means that a 1% increase in M2 per GDP is expected to increase Agricultural value added per GDP by 0.445%. This results makes economic sense since a rise in broad money supply increases money holdings (including farmers), this should increase savings but in Ghana where the unbanked forms more than half of the citizens, spending skyrocket. This spending in the case of farmers can be a rise in purchase of production inputs and other farming tools.

Secondly, Domestic credit to private sector as a share of GDP (LOGDCP) contrary to expectation is inversely correlated with Agricultural value added as a share of GDP with a coefficient magnitude (-0.134). The meaning is that, a rise in domestic credit to private sector as a share of GDP leads to fall in Agricultural value added as a share of GDP. This unexpected result is not absolutely surprising because availability is not accessibility. Albeit Agricultural sector in Ghana been highly dominated by private, small scale farmers, the sector is highly characterized by failures and inefficiencies and hence unable to attract a chunk of this funds. In a free market economy like Ghana, resource allocations or loan disbursement by financial institutions to real sectors or individuals strongly depend on the efficiency and credit history of the sector (or individual).

Next is Agricultural machinery and tractors per Agricultural land (LOGAM_AL), which unexpectedly is inversely correlated with Agricultural value added as share of GDP with coefficient value (-6.970). Explicably, a rise of Agricultural machinery by 1% leads to a 6.970 fall in Agricultural value added as a share of GDP.

The fourth variable, rural population as a fraction of total population (LOGRP_TP) expectantly, is directly correlated with Agricultural value added as a fraction of GDP with a coefficient magnitude (2.923). This basically implies, an increase in rural population as a fraction of total population by 1% improves Agricultural value added as a share of GDP by 2.923%. In Ghana, Agricultural activities (farming) is largely carried out in rural areas by rural dwellers. Almost all Agricultural products are from rural areas and production is labor intensive. This makes rural population very relevant and therefore not surprising that it is a key determinant of Agriculture. This control variable was only employed in the Autoregressive Distributed Lag Model because it failed to meet the requirement of cointegrating regression (FMOLS and CCR) due to it not been stationary (like the rest of the variables) at both level and first difference (that is it is

neither I(0) nor I(1)) It was significant at 1% level with a positive coefficient of magnitude 1.344 from the Canonical cointegration estimates. The R-Square is 0.357370, which means, only 36% of the changes in Agricultural value added per GDP is explained by the regressors in this work.

4.3.2.2 Short Run ARDL Estimates

Table 6: ARDL Short-run Coefficients Estimates

Dependent variable: LOGAV_G

Variables	Coefficients	Std Error	t-statistic	p-value
LOGM2_G	0.169459	0.053564	3.163695	0.0028***
LOGDCP	-0.051002	0.027723	-1.839695	0.0724*
LOGAM_G	-6.776223	2.083725	-3.251976	0.0022***
LORP_TP	1.113644	0.237437	4.690265	0.0000***
DFINSAP	-0.001282	0.015250	-0.084069	0.9334
CointEq(-1)	-0.381007	0.094818	-4.018304	0.0002***

The table above (table 5) is an autoregressive distributed lag long short-run coefficient estimate with m2 as a fraction of GDP (logm2_g), agricultural labor (logrp_tp), domestic credit to private sector as a fraction of GDP (logdcp), agricultural machinery and tractors(logam_al) and speed of adjustment been significant at least at one of the conventional levels. The rest of the variables however are insignificant.

Source: estimated using Eviews 9.0

The results above which is a short-run coefficients estimates is almost similar to the long-run estimates in table 6 in terms of significance and sign relation but have different coefficient magnitude and values. This results therefore confirm the long run estimates and the speed of adjustment (CointEq(-1)) which is negative and significant also confirm that, indeed the

variables are cointegrated. The speed of adjustment tells how fast a variable will adjust back to its steady level when it experiences a shock. The value is 0.381.

Residual Equation

$$\text{Cointeq} = \text{LOGAV_G} - (2.9229 \cdot \text{LOGRP_TP} - 0.1339 \cdot \text{LOGDCP} + 0.4448 \cdot \text{LOGM2_G} - 6.9698 \cdot \text{AM_AL} - 0.0034 \cdot \text{DFINSAP} + 0.4002) \quad (22)$$

The expression above states that, the error term (residual) is the observed (LOGAV_G) less the estimated $(2.9229 \cdot \text{LOGRP_TP} - 0.1339 \cdot \text{LOGDCP} + 0.444 \cdot \text{LOGM2_G} - 6.9698 \cdot \text{AM_AL} - 0.0034 \cdot \text{DFINSAP} + 0)$.

Table 7: Residual Diagnostic Test

RESIDUAL	Chi-Square Values	P-Values
SERIAL CORRELATION	0.2000	0.2420
HETEROSKEDASTICITY	0.5377	0.5732
NORMALITY		0.3128

The table above (table 8) is results from autocorrelation, heteroskedasticity and normality. The p-values in each case is above 0.05 indicating that there is no serial correlation, heteroskedasticity and the estimate is normal.

The Jarque-Berra value was 2.3243.

Source: estimated using Eviews 9.0

4.3.2.3 Canonical Cointegration (CCR) Estimates

Table 8: CCR Estimates

Variables	Coefficient	Std Error	t-statistic	P-value
LOGM2_G	0.116214	0.182898	0.635405	0.5281
LOGDCP	-0.256272	0.085470	-2.998387	0.0043***
LOGAM_AL	2.683034	0.302505	8.869379	0.0000***
DFINSAP	-0.060451	0.032140	-1.880884	0.0659*
R-squared 0.7077, Adjusted R-squared 0.6898, Long-run variance 0.0096, Long-run covariance estimate (Barlett kernel, Andrews bandwidth 9.8908).				

*The *, **, *** indicates the significance levels 10, 5 and 1 percent respectively.*

Source: estimated using Eviews 9.0

Three of the variables in table 7 namely, Domestic credit as a fraction of GDP (LOGAV_G), Agricultural Machinery and tractors per Agricultural land (LOGAM_AL) and financial sector adjustment programme (DFINSAP) were significance whiles M2 as a fraction of GDP was insignificant.

4.3.2.4 Fully Modified Ordinary Least Square Estimates

Table 9

Variables	Coefficient	Std Error	t-statistic	p-value
LOGM2_G	0.105586	0.181959	0.580270	0.5644
LOGDCP	-0.251855	0.080818	-3.116328	0.0031***
LOGAM_AL	2.698490	0.306053	9.817076	0.0000***
DFINSAP	-0.058840	0,033658	-1.748156	0.0867*
R-squared 0.7077, Adjusted R-squared 0.6898, Long-run variance 0.0096, Long-run covariance estimate (Barlett kernel, Andrews bandwidth 9.8908).				

Source: estimated using Eviews 9.0

Three of the variables in table 7 namely; Domestic credit as a fraction of GDP (LOGAV_G), Agricultural Machinery and tractors per Agricultural land (LOGAM_AL) and financial sector adjustment program (DFINSAP) were significance whiles M2 as a fraction of GDP was insignificant.

4.3.2.5 Juxtaposing FMOLS and Canonical Cointegration Estimates

The tables, 7 and 8 are results of canonical cointegration and fully modified ordinary least square Cointegrating regression respectively. The results in table 7 indicates that, the dependent variable, Agricultural value added as a fraction of GDP is positively correlated with broad money supply to GDP (LOGM2_G) but it is insignificant at all conventional levels. This is the same for the FMOLS estimate in table 8.

Secondly, the domestic credit to private sector as a fraction of GDP (LOGDCP) is negatively correlated with Agricultural value added per GDP with a coefficient magnitude -0.256% from the canonical cointegration estimates. This implies, a 1% change in domestic credit to private sector as a fraction of GDP is expected to decrease Agricultural value added as a share of GDP by 0.256%. Asymptotically, similar result was derived from the FMOLS with a coefficient -0.252. It is significant at 1% level. This unexpected result is not absolutely surprising because availability is not accessibility. Albeit Agricultural sector in Ghana been highly dominated by private, small scale farmers, the sector is highly characterized by failures and inefficiencies and hence unable to attract a chunk of these funds. In a free market economy like Ghana, resource allocations or loan disbursement by financial institutions to real sectors or individuals strongly depend on the efficiency and credit history of the sector (or individual). To this end, the sector that acquires the chunk of the resources (private) in Ghana is Service sector with the Agricultural languishing below. Therefore, the more the share of domestic credit to private sector per GDP rises, the more shrunk the funds that goes to the Agricultural sector in relative terms, consequently less investment and interestingly, since the dependent variable is agricultural value added over GDP, it will decrease because the denominator will increase.

Thirdly, the results from canonical cointegration table shows the sign of the coefficient of Agricultural machinery and tractors per Agricultural land (LOGAM_AL) to be positive (with magnitude 2.683) which is similar with the FMOLS estimates but with a slight change in coefficient value (2.698). This positive sign means, a rise in Agricultural machinery and tractors is expected to increase Agricultural value added as a fraction of GDP (Agricultural Land is assumed to be constant. This assumption is near truth as data from the WDI on the variable shows it is somewhat fixed in Ghana). The interpretation of the magnitude is that, a 1% increase in Agricultural capital (Agricultural machinery and tractors) is expected to increase Agricultural value added per GDP by 2.683% in the case of CCR and 2.698% for FMOLS estimator%. The

positive sign was the priori sign and this is so because, an increased Agricultural mechanization improve efficiency as well as productive capacity and hence, leads to a shift in production frontier and obviously increase Agricultural output.

The final variable in the model, financial sector adjustment program (FINSAP) which is deterministic and qualitative in nature was introduced as a dummy variable to curtail the possible structural breaks due to introduction of financial sector reforms in 1988 which saw a regulated sector liberalized. The sign of coefficient of the dummy variable in both CCR and FMOLS is negative indicating an inverse relation. This means, FINSAP introduction was inimical to the Agricultural sector growth. This although unexpected still make sense especially in the case of Ghana. The implementation of the financial sector reforms had a positive impact on the financial sector through the establishment of many private banks which increased financial depth. The rising number of private banks however boosted investment in the service and industrial sector to the detriment of agriculture (especially if the sector is dominated by small scale as is the case in Ghana). This finding corroborates that of Dehejia and Muney, 2007 in their work: Does Financial development matter to Sectors of the American Economy.

The R-Square for FMOLS and Canonical Cointegration are the same, which is 0.708. The 0.708 R-square value means 70.8% of a change in the dependent variable is explained by the regressors in the estimates.

One important estimate is the long run variance which indicates how the residuals vary in the long run u_{1t} from u_{2t} . The variance for both FMOLS and CCR are the same (0.009683).

CHAPTER FIVE

CONCLUSION AND POLICY RECOMMENDATION

5.0 Introduction

This chapter is the last chapter and it presents the brief of the findings, Conclusion, policy recommendations for policy makers and recommendations for where future studies should be directed at. The summary covers the brief echoing of the stated problem, study objectives, methodology employed and findings from the study. The Conclusion covers the complete findings vis-a-vis the hypothesis of the study whiles the recommendation captures solutions and suggestions proffered by the researcher based on findings made as a remedy to the problem and for future studies respectively.

5.1 Brief Findings

This study was purposefully carried out to determine or find out the effect of financial depth on Agricultural value added per GDP. Time series data was employed covering a period from 1961 to 2014. The study also specifically examined the trend dynamics (short-run and long-run) of financial development and Agricultural value added as a fraction of GDP relationship. For the trend analysis, ARDL Bound test and FMOLS Wald test were used. Three different regression estimators were used for the impact analysis in order to derive a more convincing results. These are Autoregressive Distributed Lag (ARDL), Fully Modified Ordinary Least Square (FMOLS) and Canonical Cointegration (CCR). The variables employed in this study are Agricultural value added per GDP, Broad money supply per GDP, Domestic credit to private sector per

GDP, Agricultural machinery and tractors per Agricultural land and rural population per total population. The econometric package used was Eviews 9.

Based on the ARDL coefficient diagnostic test (Wald test), the results shows that the variables were cointegrated in both short and long run and same was the case in FMOLS Wald test when the variables; Agricultural value added fraction to GDP, M2 share to GDP, Domestic credit to private sector fraction to GDP and Agricultural Machinery and tractors per Agricultural land were employed in the model with FINSAP inserted in the model as a deterministic variable.

The results from ARDL, FMOLS and CCR all indicated that increased expansion in the financial sector (when Domestic credit to private sector as a share of GDP was used as proxy) leads to a fall in Agricultural value added fraction of GDP. However with Broad Money Supply fraction of GDP, it was positively related to Agricultural value added per GDP but significant only in the ARDL ordinary least square estimate.

A control variable, Agricultural machinery and tractors as a ratio of Agricultural land was found to be related positively to Agricultural value added share of GDP (meaning the more mechanized the agricultural sector, the more the output) in both CCR and FMOLS.

The control variable, Rural population as a fraction of total population (loosely used as a proxy to Agricultural labor) was only employed in the ARDL model and the results revealed that, rising rural population relative to total population improves Agricultural value added per GDP.

Financial sector adjustment program (FINSAP) was also introduced as a dummy variable to account for a likely structural breaks that could result due to the positive impact it had on the economy when implemented specifically in 1988. The results revealed that, FINSAP implementation was inimical to Agricultural value added as a fraction of GDP.

5.2 Conclusion

Financial development impact on Agriculture has not received much attention. Relatively, this area was investigated by few researchers globally. In Ghana for instance, not a single work could be found on this relationship, therefore making this work very relevant. Agriculture sector is still important in the Ghanaian economy because it is the second largest sector to GDP and employ citizens more than any other sector. The findings of this study exude a short-run and long-run relationship among the variables in both the FMOLS Wald test and ARDL/Bound test approach.

The study also contrary to many research outside the researchers country, espoused a negative correlation between financial development (Domestic credit to private sector as a share of GDP) and Agricultural value added per GDP. In the case of M2 as a fraction of GDP as a proxy to financial development, the relationship was positive (but note results from only one estimator out of the three was significant, ARDL).

This opposing results from these two different indicators shows that, the effect that financial development will have on Agricultural value added as a fraction of GDP depends on the financial development indicator used.

5.3 Policy Recommendations

Considering the findings derived from this study, the researcher recommend the following:

Albeit the short-run and long-run relationship between financial development and Agricultural value added as a share of GDP, the nature of the correlation in terms of the two financial depth indicators used and the dependent variable were opposing (positive for M2 per GDP and negative for Domestic credit to private sector per GDP), therefore Government in order to ensure

the Agricultural sector grow through finance should do so through direct financial aids and subsidies on production inputs because the sector cannot compete for the private sector credit.

The results shows that a rise in Domestic credit to private sector per GDP leads to fall in Agricultural value added per GDP, this means the sector relatively is unable to acquire a chunk of the private credit and so therefore, if the main aim is to improve Agriculture output, then there is no need for Government to target Domestic credit to private sector as a share of GDP.

Broad money supply to GDP ratio which is bigger than the other indicator and also include public spending was positively related to Agricultural value added per GDP and hence an evidence that Government can improve the sector through direct extension of funds from Government to the sector. This can be done by setting up agriculture sensitive financial institutions through public private partnership and Government serving as guarantor to farmers in accessing funds.

5.4 Recommendations for Future Studies

Indicators of financial development used as proxy and the method of estimation to a large extend has an effect on the outcome of the research (Adu et al, 2013). Afandideh (2010) and Chisasa (2012) opined that financial development is directly related to Agricultural growth whiles Dehejia and Munley (2007) concluded that financial development is negatively related to farming in the United States. Future studies can be geared towards causality, use of different or more variables as financial development proxy and different estimation method can also be used.

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APPENDIX

ARDL Cointegration Estimate

Short Run Coefficients

D(LOGRP_TP)	1.113644	0.237437	4.690265	0.0000
D(LOGDCP)	-0.051002	0.027723	-1.839695	0.0724
D(LOGM2_G)	0.169459	0.053564	3.163694	0.0028
D(AM_AL)	-6.776223	2.083725	-3.251976	0.0022
D(DFINSAP)	-0.001282	0.015250	-0.084069	0.9334
CointEq(-1)	-0.381007	0.094818	-4.018304	0.0002

Cointeq = LOGAV_G - (2.9229*LOGRP_TP -0.1339*LOGDCP
+ 0.4448

*LOGM2_G -6.9698*AM_AL -0.0034*DFINSAP + 0.4002)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGRP_TP	2.922900	0.551632	5.298642	0.0000
LOGDCP	-0.133862	0.060199	-2.223675	0.0312
LOGM2_G	0.444768	0.147518	3.015016	0.0042
AM_AL	-6.969801	2.864988	-2.432750	0.0190
DFINSAP	-0.003365	0.040048	-0.084020	0.9334
C	0.400164	1.385296	0.288866	0.7740

ARDL Bounds Test

Date: 09/27/16 Time: 21:38

Sample: 1962 2014

Included observations: 53

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.169238	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

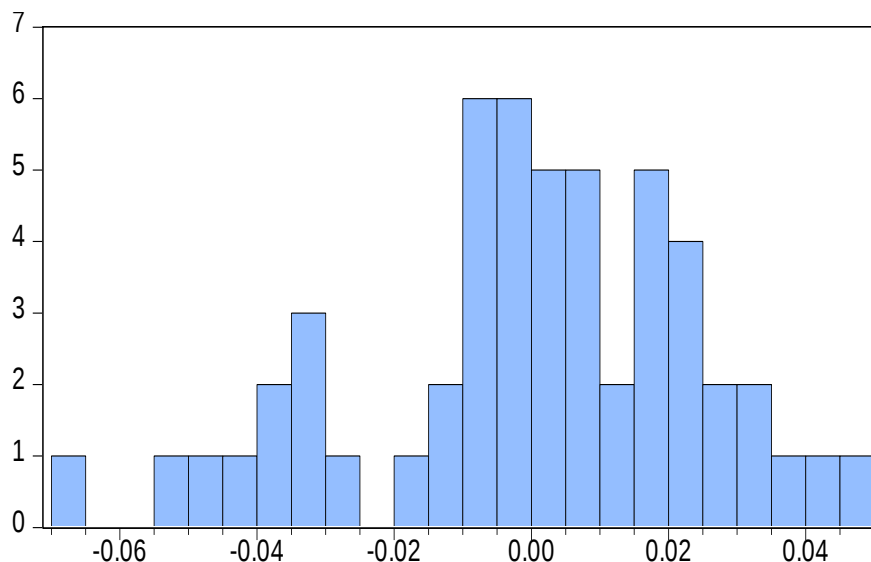
Test Equation:

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.823408	Prob. F(7,45)	0.5732
Obs*R-squared	6.017751	Prob. Chi-Square(7)	0.5377
Scaled explained SS	4.306345	Prob. Chi-Square(7)	0.7439

Test Equation:
 Dependent Variable: RESID^2
 Method: Least Squares
 Date: 09/27/16 Time: 17:30
 Sample: 1962 2014
 Included observations: 53

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010360	0.017230	0.601287	0.5507
LOGAV_G(-1)	0.002672	0.003062	0.872765	0.3874
LOGRP_TP	-0.005450	0.007667	-0.710911	0.4808
LOGDCP	0.001675	0.000895	1.870983	0.0679
LOGM2_G	-0.001891	0.001730	-1.093371	0.2800
AM_AL	0.018311	0.067282	0.272154	0.7867
AM_AL(-1)	-0.023078	0.036374	-0.634466	0.5290
DFINSAP	-0.000401	0.000492	-0.814789	0.4195
R-squared	0.113542	Mean dependent var	0.000592	
Adjusted R-squared	-0.024351	S.D. dependent var	0.000843	
S.E. of regression	0.000853	Akaike info criterion	-11.15757	
Sum squared resid	3.27E-05	Schwarz criterion	-10.86017	
Log likelihood	303.6755	Hannan-Quinn criter.	-11.04320	
F-statistic	0.823408	Durbin-Watson stat	2.389591	
Prob(F-statistic)	0.573153			



Series: Residuals Sample 1962 2014 Observations 53	
Mean	-2.53e-16
Median	0.000630
Maximum	0.046539
Minimum	-0.065007
Std. Dev.	0.024573
Skewness	-0.512905
Kurtosis	2.985324
Jarque-Bera	2.324274
Probability	0.312817

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.406804	Prob. F(1,44)	0.2420
Obs*R-squared	1.642058	Prob. Chi-Square(1)	0.2000

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 09/27/16 Time: 17:33

Sample: 1962 2014

Included observations: 53

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGAV_G(-1)	-0.059322	0.106824	-0.555325	0.5815
LOGRP_TP	0.063251	0.242312	0.261032	0.7953
LOGDCP	-0.012449	0.029527	-0.421612	0.6754
LOGM2_G	0.013615	0.054545	0.249607	0.8041
AM_AL	-0.045987	2.074732	-0.022165	0.9824
AM_AL(-1)	0.140479	1.127678	0.124573	0.9014
DFINSAP	0.001776	0.015255	0.116429	0.9078
C	-0.085458	0.536075	-0.159415	0.8741
RESID(-1)	0.206411	0.174027	1.186088	0.2420
R-squared	0.030982	Mean dependent var	-2.53E-16	
Adjusted R-squared	-0.145203	S.D. dependent var	0.024573	
S.E. of regression	0.026296	Akaike info criterion	-4.285268	
Sum squared resid	0.030425	Schwarz criterion	-3.950691	
Log likelihood	122.5596	Hannan-Quinn criter.	-4.156606	
F-statistic	0.175850	Durbin-Watson stat	1.810854	
Prob(F-statistic)	0.993079			

Dependent Variable: LOGAV_G
Method: Fully Modified Least Squares (FMOLS)
Date: 09/27/16 Time: 18:13
Sample (adjusted): 1962 2014
Included observations: 53 after adjustments
Cointegrating equation deterministics: DFINSAP
Regressor equations estimated using differences
Long-run covariance estimate (Bartlett kernel, Andrews bandwidth
= 9.8908)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGM2_G	0.105586	0.181959	0.580270	0.5644
LOGDCP	-0.251855	0.080818	-3.116328	0.0031
AM_AL	2.698490	0.306053	8.817076	0.0000
DFINSAP	-0.058840	0.033658	-1.748156	0.0867
R-squared	0.708550	Mean dependent var	1.638712	
Adjusted R-squared	0.690706	S.D. dependent var	0.110184	
S.E. of regression	0.061278	Sum squared resid	0.183993	
Long-run variance	0.009683			

Dependent Variable: LOGAV_G
Method: Canonical Cointegrating Regression (CCR)
Date: 09/27/16 Time: 18:16
Sample (adjusted): 1962 2014
Included observations: 53 after adjustments
Cointegrating equation deterministics: DFINSAP
Regressor equations estimated using differences
Long-run covariance estimate (Bartlett kernel, Andrews bandwidth
= 9.8908)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGM2_G	0.116214	0.182898	0.635405	0.5281
LOGDCP	-0.256272	0.085470	-2.998387	0.0043
AM_AL	2.683034	0.302505	8.869379	0.0000
DFINSAP	-0.060451	0.032140	-1.880884	0.0659
R-squared	0.707758	Mean dependent var	1.638712	
Adjusted R-squared	0.689866	S.D. dependent var	0.110184	
S.E. of regression	0.061361	Sum squared resid	0.184493	
Long-run variance	0.009683			

Wald Test:

Equation: FMOLS

Test Statistic	Value	df	Probability
F-statistic	3690.277	(4, 49)	0.0000
Chi-square	14761.11	4	0.0000

Null Hypothesis: $C(1)=C(2)=C(3)=C(4)=0$

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.105586	0.181959
C(2)	-0.251855	0.080818
C(3)	2.698490	0.306053
C(4)	-0.058840	0.033658

Restrictions are linear in coefficients.

Descriptive Statistics

	LOGAV_G	LOGM2_G	LOGDCP	AM_AL	LOGRP_TP
Mean	1.637970	1.338474	0.834872	0.642798	1.795785
Median	1.653271	1.334555	0.860687	0.643467	1.815249
Maximum	1.813213	1.532860	1.299007	0.660805	1.881972
Minimum	1.350169	1.053270	0.188160	0.591928	1.668460
Std. Dev.	0.109275	0.119706	0.286045	0.011261	0.062796
Skewness	-0.891699	-0.405459	-0.419730	-1.609938	-0.531597
Kurtosis	3.495052	2.556417	2.329575	8.709363	1.989994
Jarque-Bera	7.707564	1.922294	2.596865	96.66998	4.838616
Probability	0.021199	0.382454	0.272959	0.000000	0.088983
Sum	88.45039	72.27758	45.08310	34.71112	96.97238
Sum Sq. Dev.	0.632878	0.759460	4.336543	0.006722	0.208994
Observations	54	54	54	54	54

Data used for the analysis

LOGAG	LOGM2/G	LOGDCP	LOGRP/TP	AM/AL
1.598641	1.272066	0.765516	1.881972	0.591928
1.625928	1.307581	0.791013	1.878797	0.626672
1.604486	1.291046	0.879773	1.875553	0.642295
1.595158	1.377509	0.84248	1.872226	0.660805
1.69829	1.311711	0.930428	1.868838	0.656478
1.680528	1.317452	0.926955	1.865365	0.656155
1.653679	1.326801	0.878894	1.861809	0.65583
1.673433	1.31576	0.937459	1.858176	0.655505
1.718297	1.28811	0.964278	1.85447	0.655178
1.731568	1.276644	0.91653	1.851515	0.654849
1.700744	1.278433	1.099819	1.850193	0.65452
1.718245	1.375077	1.002615	1.848854	0.654189
1.726408	1.35536	0.727812	1.847511	0.653857
1.749553	1.333793	0.754105	1.846158	0.653523
1.725094	1.418917	0.762259	1.844794	0.652713
1.751061	1.464091	0.77105	1.84342	0.652377
1.784876	1.435899	0.700562	1.842035	0.651569
1.813213	1.388427	0.546685	1.840645	0.650765
1.802024	1.323353	0.450074	1.839239	0.650425
1.778557	1.268426	0.340963	1.837822	0.650085
1.742458	1.219194	0.266557	1.8364	0.649743
1.773477	1.234641	0.255839	1.834967	0.648483
1.745314	1.05327	0.18816	1.833517	0.648138
1.715198	1.072371	0.344276	1.831172	0.647342
1.685129	1.134129	0.492537	1.826748	0.646548
1.681485	1.130801	0.55968	1.822227	0.6462
1.70504	1.152444	0.498883	1.817612	0.645851
1.696505	1.168676	0.49683	1.812887	0.645058
1.693895	1.228323	0.766752	1.808083	0.644706
1.653864	1.150514	0.692732	1.803177	0.643893
1.658579	1.192087	0.563165	1.798167	0.643041
1.652863	1.312302	0.693897	1.793057	0.642685
1.616649	1.297442	0.684682	1.787857	0.641985
1.623021	1.352436	0.720162	1.782544	0.641202
1.63046	1.335317	0.705313	1.777137	0.640005
1.642249	1.313785	0.778519	1.771617	0.638823
1.602628	1.377342	0.913554	1.766011	0.637145
1.604583	1.359026	0.971222	1.760287	0.63522
1.601275	1.381888	1.099062	1.754471	0.63872
1.595647	1.449728	1.145243	1.748738	0.637435
1.594669	1.497558	1.074977	1.743502	0.636791
1.593412	1.53286	1.08456	1.738186	0.635999
1.604641	1.492005	1.096668	1.732788	0.63491

1.618543	1.514848	1.119668	1.727297	0.633617
1.612099	1.506641	1.191565	1.721745	0.628881
1.492974	1.366696	1.045081	1.716104	0.630429
1.473298	1.410217	1.161021	1.71038	0.63058
1.501401	1.438724	1.200905	1.704571	0.632327
1.51728	1.450973	1.194738	1.698701	0.633408
1.488948	1.471573	1.184399	1.692732	0.634492
1.41535	1.484997	1.17754	1.68669	0.634449
1.372919	1.482327	1.194369	1.680616	0.634643
1.364578	1.466159	1.232261	1.67454	0.634432
1.350169	1.519831	1.299007	1.66846	0.634221